

DOCUMENT RESUME

ED 122 916

PS 008 342

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 TITLE Discrimination of Male Voice Quality by 8 and 9 Week Old Infants.
 INSTITUTION Kansas Univ., Lawrence. Kansas Center for Research in Early Childhood Education.
 SPONS AGENCY National Inst. of Education (DHEW), Washington, D.C.
 PUB DATE Apr 75
 GRANT NIE-G-00-3-0104
 NOTE 13p.; Paper presented at the biennial meeting of the Society for Research in Child Development (Denver, Colorado, April 10-13, 1975)

EDRS PRICE MF-\$0.83 HC-\$1.67 Plus Postage
 DESCRIPTORS Auditory Visual Tests; *Aural Stimuli; *Discrimination Learning; *Eye Fixations; Infant Behavior; *Infants; Males; Speech; *Visual Stimuli

ABSTRACT

This paper reports a study which investigated 2-month-old infants' auditory discrimination of tone quality in the male voice, extending a previous study which found that voice quality changes (soft versus harsh) in a female voice were discriminable by infants at this age. Subjects were 20 infants, tested at 8 and 9 weeks of age. Each infant was presented with a visual stimulus (a 4 x 4 black and white checkerboard), and an auditory stimulus (stanzas of a poem read by a male in a soft tone or a harsh tone). In one condition (E), visual fixation of the visual stimulus was accompanied by the soft voice tape recording; in another condition (F), the visual stimulus was accompanied by the harsh voice recording. Experimental subjects received conditions E and F in either an EPEF design or a counterbalancing FEPE design. Two control groups received either EEEE or FFFF designs. The effect of auditory stimulus changes on recovery of visual fixation was determined by comparing experimental and control fixation patterns. Reliable increases in visual fixation did occur with changes in auditory stimuli involving male voice tone quality. A contrast is noted between this finding and the result of an earlier study which indicated that fathers spend little time vocalizing to their infants. (Author/GO)

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Discrimination of Male Voice Quality

By 8 and 9 Week Old Infants¹

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PS 008342

It has been shown that young infants can make very fine distinctions in isolated language-related stimuli such as consonants (Eimas, Siqueland, Jusczyk, and Vigorito, 1971; Moffitt, 1971; Trehub and Rabinovitch, 1972). While it is possible that early language listening experience for the infant is characterized by some sort of systematic attention to single language elements, the environment, in fact, presents the infant with very complex and extended, though probably repetitious, language samples. There have been several reports that have given evidence concerning the role of complex language stimuli in infant behavior (Tulkin, 1971; Tulkin and Kagan, 1971; Turnure, 1971). The most consistent findings seem to relate to social class variables. And, the subjects of these studies were all over three months of age and most of them older. Boyd's (1972) demonstration with seven and eight week old infants is probably the clearest evidence at the youngest age that infants can discriminate between two different voices with all the complexity and grossness involved in such stimuli. However, Lewis (1951) reported that infants respond to an adult voice by ceasing to cry and that the infant can discriminate intensities of sounds. Eisenberg and her colleagues (Eisenberg, 1965; 1966; 1967; 1970; Eisenberg, Griffin, Coursin, and Hunter, 1954) have experimentally substantiated some of Lewis' observations with newborns.

Intonation has been one variable that has been suggested as playing a key role in language stimuli for young infants. As early as 1922 Schafer (reported in Lieberman, 1967) noted that a nine-month-old infant responded to intonation of a phrase, disregarding the word content of the phrase. Lieberman (1967) has also reported that Lowenfeld, in 1927,

and Buhler and Hetzer, in 1928, reported that infants from two months onward responded positively to the human voice, while infants from the age of three months onward responded positively to friendly tones and negatively to angry tones of voice using eye and head movements for the response indicators. Lieberman (1967) has suggested that pitch of voices and some aspects of intonation and content might be relevant cues used by infants attending to language stimuli. Lewis (1951) and Leopold (1953) also suggested that intonation takes on a linguistic reference quite early and suggested, further, that phonetic pattern later replaces intonation as the dominant feature in evoking responses from the child. Culp and Boyd (1974) indicated that voice quality changes (soft versus harsh voice) in a female voice was discriminable by 8 and 9 week old infants.

Given the data on features of language stimuli that might seem prepotent in the natural experience of infants, the following experiment was undertaken to investigate language discriminative abilities of infants at two months of age. The language stimuli differed in what might be grossly called intonation or tone quality of a male speaker.

Four groups of subjects were used in this experiment. Experimental subjects constituted two groups and received both conditions E and F in either an initial EFEF design or a counterbalancing FEFE design. In condition E, visual fixation of a 4 x 4 checkerboard stimulus was accompanied by a tape recording of the first two stanzas of the poem "The Swing" by Robert Louis Stevenson read by a male in a "soft" voice quality. In condition F, visual fixation of the same 4 x 4 checkerboard stimulus was accompanied by a tape recording of the same male reading

the same stanzas of the same poem in a "harsh" voice quality. Two control groups were run in either an EEEE or a FFFF design. Twelve subjects (six males and six females) were assigned to the experimental groups and eight (four males and four females) were assigned to the control groups. The mean age of the infants was 7.99 weeks for the first session of the experiment and 9.03 weeks for the second session of the study. An additional 27 infants began the study but did not complete both sessions.

The visual stimulus was a black and white checkerboard slide. The stimulus measured approximately six inches square when projected.

The auditory stimuli were tape recordings of a male, unfamiliar to the infant, reading the first two stanzas of "The Swing" by Robert Louis Stevenson. Upon instructions the reader was tape-recorded reading in a "soft" tone (Stimulus E) and also in a "harsh" tone (Stimulus F). Spectrographic analysis of the tapes indicated that the two recordings had the same fundamental frequency (average of 190 cycles per second) and intensity. The original recordings were re-recorded to make an hour long recycling tape.

A three-sided brown masonite experimental booth was used. The center panel contained a centered six-inch square plexiglas back-projection screen. In the booth was a crib in which was placed a foam padded infant carrier. Two observers sat on office chairs located between the center panel of the booth and the wall of the equipment room. Styro-foam panels were positioned so that the observers could not see each other while observing. The observers wore headphones providing music so the observers could not tell which auditory condition was in

effect. A Kodak Carousel projector was automatically programmed to present slides by rear screen projection. Solid state programming equipment linked the observers' keys to a twenty-pen Esterline Angus Event Recorder and the projector such that offset of the keys for two consecutive seconds offset the slide, injected an inter-stimulus interval of approximately two seconds and onset of the next stimulus. The auditory stimulus was presented by two Uher tape recorders played through a speaker located beneath the crib in the booth.

The results are presented in terms of the reliability of the observations and group analyses. The mean inter-observer agreement calculated on a half-second to half-second basis for all sessions in the study was .87 with a range from .80 to .98.

To evaluate the effectiveness of stimulus change (soft to harsh or harsh to soft voice) to recruit recovery of visual fixation, analyses were made of the increase in visual fixation following stimulus change in the experimental groups compared to changes in visual fixation in the control groups at the point when stimulus change should have, but did not occur. The dependent measure used for these analyses was the difference between the mean of the two criterion fixations prior to stimulus change and the mean of the two trials immediately following stimulus change in the experimental groups and the difference between the mean fixation times of corresponding trials in the control groups. Analysis failed to reveal any differences attributable to sex of subject, session, or order of stimulus presentation. With the factors of sex, session, and order combined, the difference scores for each phase of experimental and control subjects was significant

(Mann-Whitney U : $U=0$, $p<.001$, one tailed test). The data contributing to these analyses are graphed in Figures 1 and 2.

Thus, on the basis of the group data it is possible to conclude that infants at the ages of 8 and 9 weeks show reliable increases in visual fixation with a change in auditory stimuli that involve voice tone quality. The results provide further evidence that auditory changes produce increases in visual fixation behavior in young infants. As such, they encourage the further use of visual attending behavior in the study of auditory discrimination.

The results of this study in conjunction with a previous study by Culp and Boyd (1974) indicate that voice quality changes in both the male voice and the female voice can be discriminated at the age of 8 and 9 weeks. This is most interesting considering that Rebelsky and Hanks (1971) reported that fathers spend little time vocalizing to their infants, while Moss (1969) reported that mothers frequently vocalize to their infants.

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Footnote

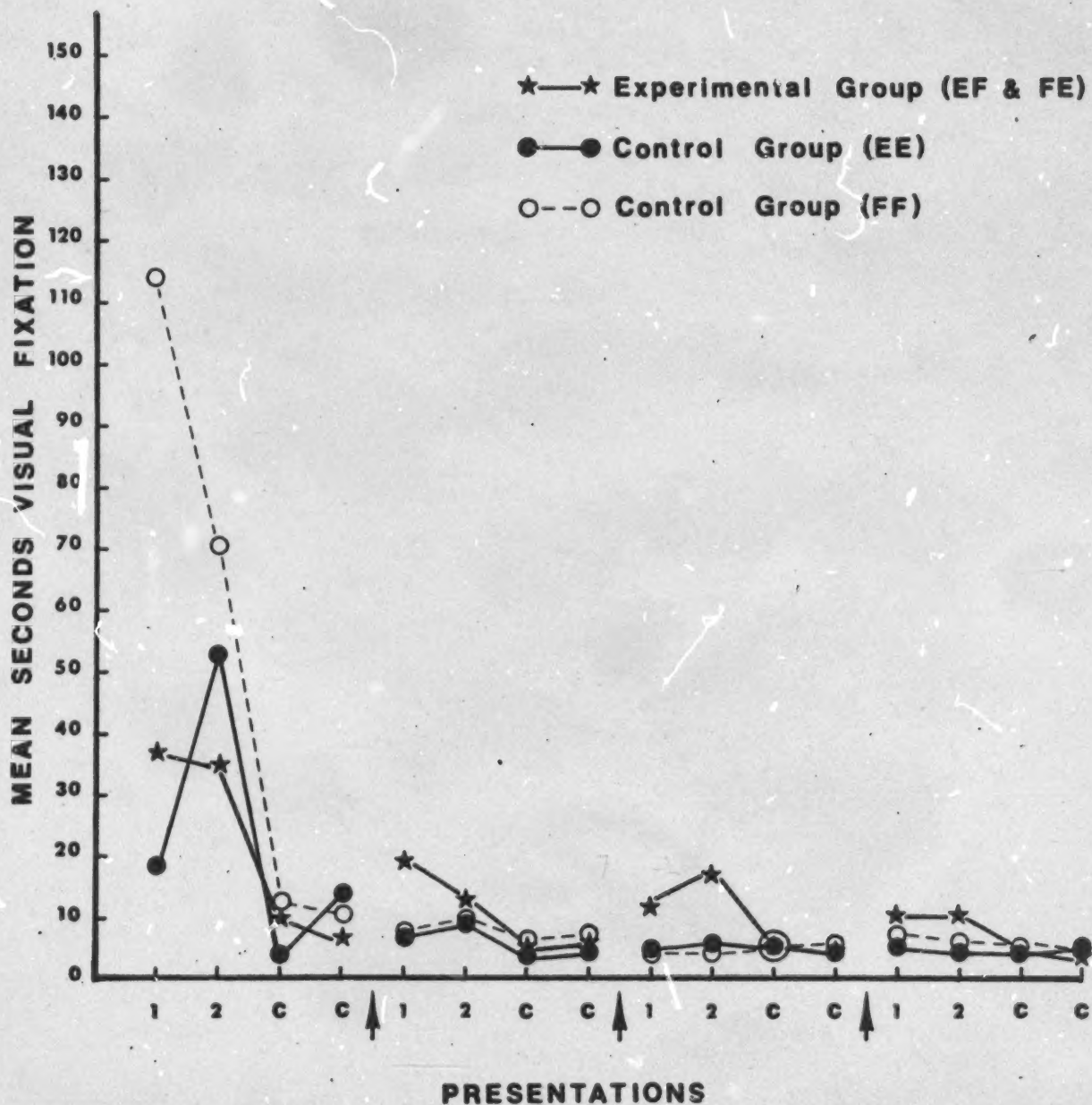
¹This research is partly supported by grant number NS 05362-12s1 funded by Department of Health, Education, and Welfare.-- Public Health Service under a contract to the Kansas Bureau of Child Research and partly supported by grant number NIE-C-00-3-0104, funded by the National Institute of Education under a contract with the Kansas Center for Research in Early Childhood Education. Opinions expressed in this report do not necessarily reflect the position or policy of the sponsoring agency.

Legends

1. Mean initial and criterion fixations to visual stimuli with soft and harsh tone auditory stimuli (sex, slide, weeks, and order combined).
2. Difference scores (mean of two criterion fixations minus mean of initial two fixations) at stimulus change point for experimental subjects and at corresponding points for control subjects.

Comparisons:

- 1 - 2 = mean of two criterion fixations of Phase 1 minus mean of initial fixations of Phase 2.
- 2 - 3 = mean of two criterion fixations of Phase 2 minus mean of initial fixations of Phase 3.
- 3 - 4 = mean of two criterion fixations of Phase 3 minus mean of initial fixations of Phase 4.



↑ Indicates Point Of Stimulus Change For The Experimental Group And Point At Which The Stimulus Would Have Changed For The Control Group

